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New records of graminicolous smut fungi in Ukraine

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Abstract – Four new records of graminicolous smut fungi are reported from Ukraine. Among these species *Tranzscheliella hypodytes* and *Urocystis agrostidis* were found on new host plants, *Ustilago aeluropodis* and *Ustilago trebouxii* are new fungi for Ukraine.

Key words – *Ustilaginomycetes, Poaceae*

Introduction

The smut fungi of Ukraine have not been investigated exhaustively. Studies on these fungi have been carried out intensively in only two regions— Halitzcia, by Polish mycologists (Wróblewski 1912, 1915, 1922; Raciborski 1910, Krupa 1888), and around Kyiv (Zelle 1925, Lavitska 1949, 1978). Other regions of Ukraine are poorly investigated for smut fungi. Southern Ukraine is part of the steppe zone. The true steppe is a unique natural phenomenon that is preserved only in Ukraine and Russia. The protected remnants of the Ukrainian steppe have a high level of endemism in local plant communities. Therefore, this region of the country is promising in terms of discovery of new species of plant pathogenic micromycetes, including smut fungi. Another interesting region of Ukraine is Volhynian Polissia situated in the northwest part of the country. Ancient forests and peat bogs contribute to great floristic diversity in this area. Thus, it is not surprising that the first detailed examination of these fungi in Ukraine provided noteworthy results. In this paper, we examined a collection from Volhynian Polissia containing two specimens of a smut fungus infecting *Melica ciliata* L. and specimens of smut fungi from the steppe region in the southern part of the country.

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Materials and methods

Sori, spore balls, and spores were studied using dried herbarium specimens. For light microscopy (LM), spore balls and spores were dispersed in a droplet of lactophenol on a microscope slide, covered with a cover glass, gently heated to boiling point to rehydrate the spores and eliminate air bubbles, and examined at 400× and 1000× magnification. For scanning electron microscopy (SEM), spores were placed on double-sided adhesive tape, mounted on a specimen stub, sputter-coated with gold, ca. 15 nm, and examined in SEM at 30 kV.

Results and discussion

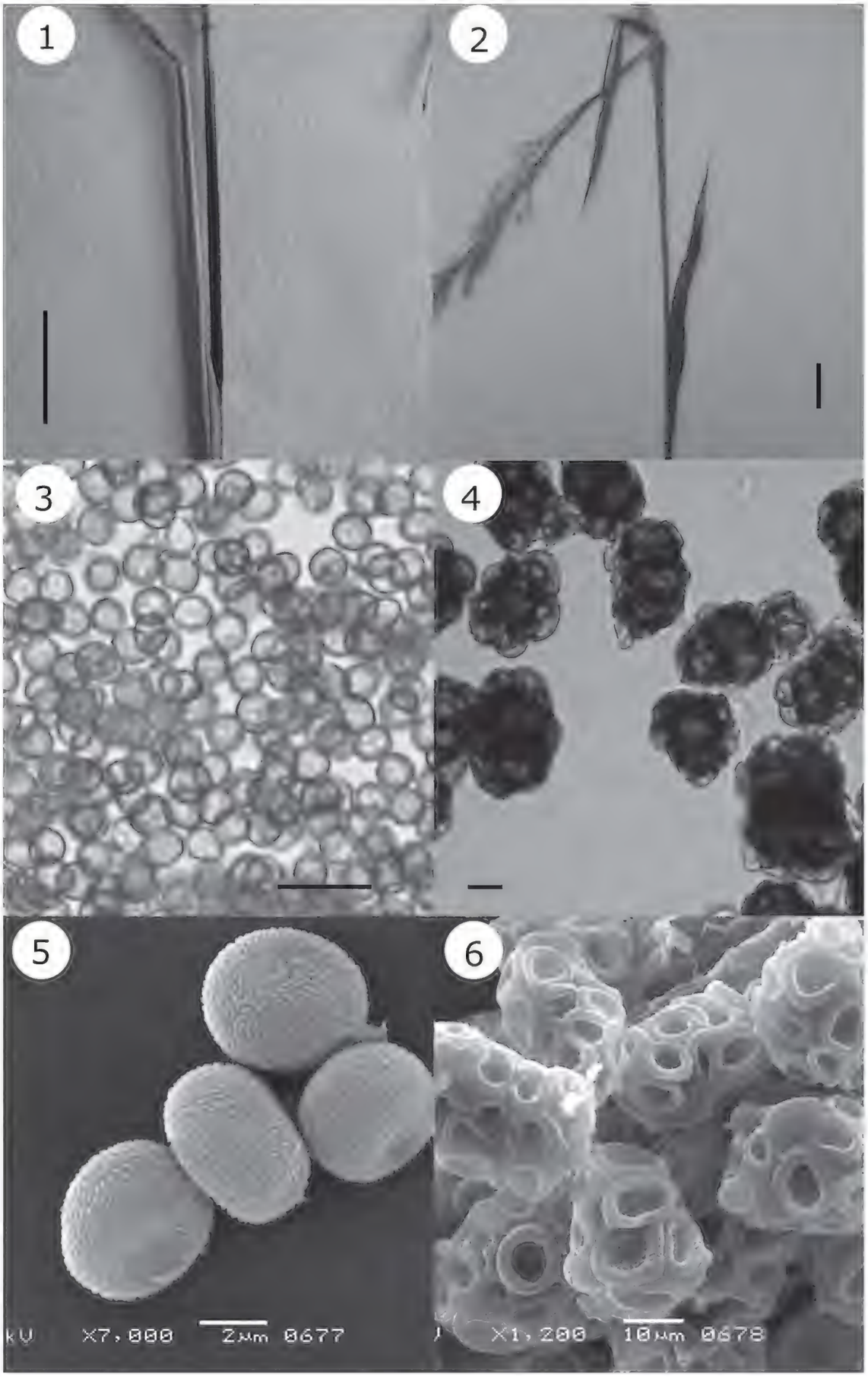
Only 45 species of smut fungi on plants belonging to different grass genera have been reported in Ukraine. The genus *Ustilago* (Pers.) Roussel is represented by 18 species, *Sporisorium* Ehrenb. ex Link by 7 species, the genera *Tilletia* Tul. & C. Tul. and *Urocystis* Rabenh. ex. Fuckel by 6 species each, *Tranzscheliella* Lavrov by 3 species, and *Jamesdicksonia* Thirum. et al., *Macalpinomyces* Langdon & Full., *Moesziomyces* Vánky, *Neovossia* Körn., and *Ustilentyloma* Savile by one species each (Zerova et al. 1971, Savchenko et al. in press). In adjacent countries, for example Poland, 44 species of graminicolous smut fungi were reported (Piątek et al. 2005), and more than 70 species of graminicolous smut fungi were reported in Russia (Karatygin & Azbukina 1989, Azbukina et al. 1995). As a result of our studies on recently collected specimens in the Volhynian Polissia and southern steppe regions of Ukraine we have extended the list of Ukrainian graminicolous smut fungi to include *Urocystis agrostidis*, *Ustilago aeluropodis*, and *U. trebouxii*. Another species, *Tranzscheliella hypodytes*, is reported on a new host plant.

Tranzscheliella hypodytes (Schltdl.) Vánky & McKenzie FIGS. 1, 3, 5

SORI in culms as a black to blackish brown, semi-agglutinated to powdery spore mass surrounding the upper internodes and in the axis of abortive inflorescences. Sori first hidden by a leaf-sheath, then naked. Infection systemic, inflorescences usually sterile. SPORES globose, subglobose to elongated, irregular or slightly to medium compressed, 3.9–5.2 × 4.6–5.7 μm (at the mean 4.6 × 5.2 μm), medium to dark olivaceous brown. Spore wall smooth, ca. 0.5 μm thick, in SEM densely and minutely verruculose on the wall surface, hyaline cap occasionally present.

SPECIMEN EXAMINED — On *Elymus uralensis* subsp. *viridiglumis* (*Poaceae*): Ukraine, Kherson region, Hola Prystan district, Black Sea Biosphere Reserve, 6.VII.2009, K. & M. Savchenko, KW 36370F.

FIGS. 1–6. 1, 3, 5: *Tranzscheliella hypodytes* on *Elymus uralensis* subsp. *viridiglumis*; 1: part of infected plant with sori; 3, 5: spores in LM and SEM. 2, 4, 6: *Urocystis agrostidis* on *Agrostis gigantea* subsp. *maeotica*; 2: infected plant with sori; 4, 6: spore balls in LM and SEM. Bars: 1, 2 = 1 cm; 3, 4, 6 = 10 μm; 5 = 2 μm.


1
2
3
4
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kU X7,000 2µm 0677
X1,200 10µm 0678

Comments: *Tranzscheliella hypodytes* was collected on a new host plant, *Elymus uralensis* subsp. *viridiglumis* (Nevski) Tzvelev (=*Agropyron lavrenkoanum* Prokudin). This fungus has an extremely broad host range that includes a number of *Elymus* spp., but this is the first report on *E. uralensis*.

Urocystis agrostidis (Lavrov) Zundel Figs. 2, 4, 6

Sori in leaves as long streaks between the veins, initially lead-colored and covered by the epidermis of the host plant which later ruptures longitudinally and the black powdery mass of spore balls becomes scattered. Spore balls globose, subglobose, 22–50 × 25–50 µm in diameter, composed of 1–4 central spores and a continuous layer of sterile cells. Spores globose to subglobose, 13–17 × 15–20 µm, olivaceous brown to light brown with a smooth surface. Sterile cells ovoid, subglobose to elongated, 7–15 µm long, pale yellowish to reddish brown.

Specimen examined — On *Agrostis gigantea* subsp. *maeotica* (*Poaceae*): Ukraine, Kherson region, Hola Prystan district, Black Sea Biosphere Reserve, 4.VII.2009, K. & M. Savchenko, KW 36369F.

Comments: During a trip to the Black Sea Biosphere Reserve (steppe zone, South of Ukraine) in 2009 a smutted specimen of *Agrostis gigantea* subsp. *maeotica* (Klokov) Tzvelev was collected. The fungus was identified as *Urocystis agrostidis*. Until now, no *Urocystis* species on *Agrostis* L. have been reported in Ukraine. This represents a new species of smut fungus for Ukraine and a new host record for the species.

Ustilago aeluropodis (Trotter) Vánky

Sori on the tip of culms replacing the inflorescences, 1–2 cm long, hidden by leaf-sheaths and young leaves, with maturation rupturing to expose the dark brown, powdery spore mass. Peridium, sterile cells, and columellae are lacking. Spores very variable in shape and size, in certain cases aggregated into loose, ephemeral spore groups, globose, ellipsoidal, 10–17 × 12–18 µm, golden brown to brown, wall 0.8–1.5 µm thick, in LM sparsely to moderately densely, minutely verruculose; in SEM minutely verruculose-echinulate.

Specimen examined — On *Aeluropus littoralis* (*Poaceae*): Ukraine, Kherson region, Hola Prystan district, Black Sea Biosphere Reserve, 18.VIII.2003, O.Yu. Umanets, KW 36361F.

Comments: During the last ten years phytotrophic micromycetes have been collected by Dr. O. Umanets in the Black Sea Biosphere Reserve (Kherson region, Ukraine). Among the specimens examined, we found several examples of vascular plants infected by smut fungi. Previously we reported *Sporisorium cenchri* (Lagerh.) Vánky as a new record for Ukraine (Savchenko et al., in press). In 2003 Dr. O. Umanets also collected infected plants of *Aeluropus littoralis*

(Gouan) Parl. We have identified the smut as *Ustilago aeluropodis*, another new record for Ukraine. Prior to this record, this species was reported in Europe only from Romania (Vánky 1994).

Ustilago trebouxii Syd. & P. Syd.

Sori in the upper leaves and leaf-sheaths as long, dark to olivaceous brown striae. Spore mass initially covered by the epidermis, exposed with maturation, becoming powdery. Spores subglobose, rarely globose to slightly irregular, 3.5–5 × 4–6 μm, pale olivaceous brown, in LM smooth, in SEM sparsely minutely punctuate-verruculose; verrucae never merged.

Specimens examined — On *Melica ciliata* (*Poaceae*): Ukraine, Volhynian region, Ratne district, near Sviate lake, 1.VIII.2009, K. Savchenko, KW 36854F, 36855F.

Comments: It is not inconceivable that this fungus will be also found in Poland and Byelorussia.

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Literature cited

Azbukina ZM, Karatygin IV, Govorova OK. 1995. Class *Ustomycetes*. Nizshie rastenija, griby i mochoobraznye Dal'nego Vostoka Rossii. Griby. T. 3. Ustomycety (golovnevye), basidiomicety (gigroforovye), ascomicety (labulbenivye i pejritshiellovye), zigomicety (entomoftorovye), chitridiomicety (blastokladievye – celomomicetovye). Nauka, Sankt-Petersburg (in Russian).

Karatygin IV, Azbukina ZM. 1989. Opredelitel' gribov SSSR. Porjadok Golovnevye. Vyp. I. Semejstvo Ustilagovye (Definitorium fungorum USSR. Ordo *Ustilaginales*. Fasc. I. Familia *Ustilaginaceae*). Nauka, Leningrad (in Russian)

Krupa J. 1888. Zapiski mykologiczne z okolic Lwowa i z Karpat stryjskich. Spravozdanie komisji fizyograficznej 23: 141–151.

Lavitska ZG. 1949. Golovnischi parazytni gryby rajona Kanivskogo biogeografichnogo zapovidnyka. Trudy Kanivskogo biogeografichnogo zapovidnyka 8(7): 27–44 (in Ukrainian).

Lavitska ZG. 1978. *Ustilaginales* in natural and artificial phytocenoses of Kiev territory. Ukr. Bot. J. 35: 417–418 (in Ukrainian).

Piątek M, Ruszkiewicz-Michalska M, Mułenko W. 2005. Catalogue of Polish smut fungi, with notes on four species of *Anthracoidea*. Pol. Bot. J. 50(1): 19–37.

Raciborski M. 1910. Mycotheca Polonica (Cześc 2, 3, nos 51–150). Kosmos 35(7–9): 768–781.

Savchenko KG, Heluta VP, Umanets OYu. 2010. *Sporisorium cenchri* (Lagerh.) Vánky, a new species of smut fungi (*Ustilaginomycetes*) for Ukraine. Ukr. Bot. J. (in press).

Vánky K. 1994. European smut fungi. Gustav Fischer Verlag, Stuttgart, Jena, New York.

Wróblewski A. 1912. Zapiski grzyboznawcze z okolicy Zaleszczyk. Sprawozdanie Komisji Fizjograficzney Polskiej Akademii Umiejetności 46(2): 21–27.

Wróblewski A. 1915. Spis grzybow zebranych na Ziemiach Polscich. Sprawozdanie Komisji Fizjograficzney Polskiej Akademii Umiejetności 49: 92–125.

Wróblewski A. 1922. Wykaz grzybów zebranych w latach 1913–1918 z Tatr, Pienin, Beskidów Wschodnich, Podkarpacia, Podola, Roztocza i innych miejscowości. I. *Phycomycetes, Ustilaginaceae, Uredinales* i *Basidiomycetes.* Sprawozdanie Komisji Fizjograficzney Polskiej Akademii Umiejetności 55–56: 1–50.

Zelle MO. 1925. Grybni chvoroby Roslyn na Kyivschini v 1923–24 rr. STAZRO, Kyiv (in Ukrainian).

Zerova MYa, Morochkovskyi SF, Radziyevskyi GG, Smitska MF. 1971. Vyznachnyk grybiv Ukrainy. Tom IV. Basydiomitsety: Dakrymitsetalni, Tremelalni, Auricularialni, Sazhkovydni, Irzhasti. Naukova Dumka, Kyiv.